Restenosis after Stent Placement for Ostial Stenosis of Vertebral Artery

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Summary

The purpose of this study was to evaluate our initial procedural success rate and angiographical outcome of stent placement for vertebral artery (VA) stenosis at the intermediate follow-up period (11.3±7.3 months). Stent placement was successfully performed in 20 procedures (19 patients), resulting in a marked reduction of stenosis from 78.7 ± 12.6 % before to 8.7% ± 10.6 after stenting. Follow-up angiography, performed after an interval of 11.3 ± 7.3 months, revealed restenosis greater than 50% in a total of 6 procedures (40%) out of 15. Although PTA with stent placement for stenosis affecting VA origin provided excellent initial success, restenosis occurred at a significant rate even during the intermediate follow-up period.

Introduction

Although extracranial vertebral artery (VA) atherosclerosis is relatively common, the natural history and optimal therapy for these lesions are both poorly defined because of the difficulty of non-invasive follow-up and the presence of co-existing intracranial lesions. Occlusive disease of the VA origin was the primary mechanism of posterior circulation ischemia in up to 10% of the patients by artery-to-artery embolism or hemodynamic stress [1,2]. Balloon angioplasty for VA stenosis has been advocated as an alternative to surgery, but the therapeutic efficacy has been limited by elastic recoil, restenosis, and dissection. Recently, there have been some reports on the usefulness of stent placement for VA stenosis [3,4,5]. The paucity of data on long-term results of stent placement in VA ostial lesions prompted us to evaluate our acute procedural success and long-term angiographic outcome in patients undergoing stent placement of VA ostial lesions.

Subject and Methods

Nineteen patients who had ostial stenosis of vertebral artery underwent stent placement. The degree of stenosis was calculated in relation to the adjacent distal normal vessel caliber. The indication of the treatment was significant VA origin stenosis (more than 60%) with symptomatic posterior circulation ischemia that was refractory to medical therapy or in asymptomatic

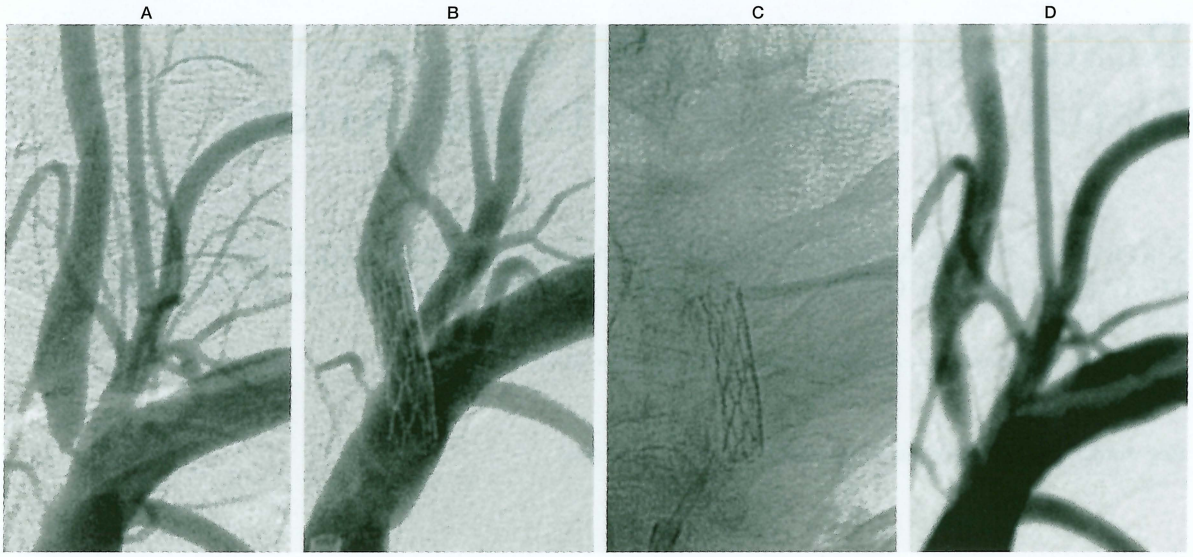

Figure 1 A case of restenosis (69 year-old-male; lt vertebral artery stenting with a Palmaz stent). The stenosis before the procedure (A) was 90% and the remaining stenosis was 0% after stent placement (B). Appearance of the deployment stent (C). After 6 months, follow-up angiography revealed restenosis (68%)(D).

cases with evidence of posterior circulation infarct on MRI. A guide catheter was placed into the subclavian artery proximal to the vertebral artery origin via the transfemoral route under systemic heparinization (ACT > 250 sec). After measuring the diameter of the vessel and the distance of the lesion, the lesion was crossed with a 0.014 - in exchange microguide wire. In the case of severe stenosis, an angioplasty balloon catheter was used to predilate the lesion to allow subsequent passage of a stent. Stent placement was performed with either a balloon-expandable stent (Palmaz, Johnson & Johnson; NIR, Boston Scientific) or a self-expandable stent (Smart, Johnson & Johnson). After stent deployment, high-pressure balloon inflation was performed, if necessary. Follow-up angiography was performed at different time intervals (4 to 27 months; mean, 11 months). Restenosis was defined as a stenosis greater than half of initial gain (stent-dilated diameter).

Results

Stent placement was performed in 20 vessels in 19 patients (male 15; female 4; age: 66.6 ± 8.9 years). One patient with bilateral VA ostial stenosis underwent stent placement on both lesions. Five (26.3%) patients were symptomatic. Stent placement was successfully performed in all procedures and resulted in a marked reduction of stenosis from 78.7 ± 12.6 before to 8.7 ± 10.6% after stenting. The procedure-related complications included symptomatic infarctions in 2 procedures (10%), resulting in minor strokes, homonymous hemianopsia, but there were no major strokes and no death. No patient had neurological symptoms during the follow-up period. Angiographic follow-up results were obtained in 14 (73.7%) of the patients. The degree of stenosis measured at follow-up angiography ranged from 10% to 81% (mean 47.2%), revealing restenosis in a total of 6 procedures (40%). The incidence of restenosis was higher in cases using a self-expandable stent (3 of 5; 60%) compared with the use of a balloon-expandable stent (3 of 11; 27.3%).

Discussion

PTA for ostial stenosis of vertebral artery has significant drawbacks such as the occurrence of elastic recoil and early restenosis in the VA ostial stenosis and stent placement is required to prevent these developing [3,4,5]. The reported restenosis rate after stent placement for VA ostial stenotic lesions varied from 0 to 16% in the follow-up ultrasonographic or angiographical studies. However, in the present study, stenosis at the follow-up period ranged 10-81% (mean 46.4%) in 15 procedures, and the restenosis rate was as high as 40%. Differences in follow-up method and period, and stent selected (length, caliber, and balloon- or

self-expandable type) may explain this difference. For example, considering the reported higher restenosis rate in longer stent deployment than shorter one [6], lack of availability of a self-expandable stent shorter than 2 cm might explain the higher restenosis rate in this type. Restenosis after PTCA has been shown to be more common in ostial lesions (48%, almost twice) in coronary atherosclerotic lesions than in non-ostial lesions [7], partly due to a lower initial success rate by lesion rigidity (bigger is better theory). Restenosis has been reported to be as high as 24-35% even after stent placement in the ostial stenosis of coronary disease [8,9]. In addition, small intimal thickness tends to more markedly influence the luminal diameter of the smaller vessels such as VA (*geometrical theory*).

Conclusions

PTA with stent placement for vertebral ostial stenosis showed good initial success with a high incidence of restenosis at the intermediate follow-up period. The development of new stent devices or medical therapy to prevent restenosis is necessary.

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